

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method of providing a representation of data distribution of data elements in a multi-dimensional data space derived from an at least one object or image by processing signals corresponding to the object or image, the representation having a hierarchical structure, the method comprising: ~~recursively~~

_____ (a) deriving an appropriate representation of a first data comprising the data distribution, the approximate representation comprising a plurality of data elements and forming a node in the hierarchical representation;

_____ (b) deriving error data comprising errors of the data elements of the approximate representation;

_____ (c) analyzing the error data, to determine if the errors of the data elements meet predetermined criteria, and

_____ (d) if the step of analyzing determines that ~~derived from said data distribution and~~ analyzing the errors of the data elements meet the predetermined criteria, marking the node as a leaf node in the hierarchical representation, or

_____ (e) if the step of analyzing determines that the errors of the data elements do not meet the predetermined criteria, repeating steps (a) to (d) recursively, using the error data as the data distribution, to form one or more further nodes in the hierarchical ~~as a second data distribution~~ when expressed in terms of the approximate representation.

2. (Currently Amended) A method as claimed in claim 1, wherein ~~the data elements are multi-dimensional and~~ the appropriate representation comprises data elements in is a subspace of ~~the a~~ data space of a data space of the data distribution of the input data.

3. (Currently Amended) A method as claimed in claim 2, wherein the subspace is derived using principal component analysis.

4. (Currently Amended) A method as claimed in ~~any preceding~~ claim 1, wherein step (e) further comprises: the analysis of the errors involves clustering

(i) prior to repeating steps (a) to (d), clustering the errors of the data elements of the approximate operation to obtain a plurality of clusters;

(ii) marking each cluster as a child node, and

(iii) repeating steps (a) to (d) recursively for each cluster, using the error data for the given cluster as the data distribution, to form one or more further nodes in the hierarchical representation.

5. (Currently Amended) A method as claimed in claim 4, wherein the step of clustering involving involves fuzzy clustering using a membership function representing the degree of membership to a cluster.

6. (Currently Amended) A method as claimed in claim 4, wherein the step (e) (iii) further comprises:

(iv) for each cluster, deriving an approximate representation comprising a subspace representative of the cluster, using analysis of the errors involves principal component analysis, each approximate representation for each cluster (local or fuzzy local principal component analysis) to produce a subspace representative of each cluster forming a further node in the hierarchical representation.

7. (Currently Amended) A method as claimed in claim 6, wherein step (e) (iii) further comprises: comprising,

(v) for data elements in a an approximate representation of a given cluster, analyzing the deriving errors of the elements when expressed in terms of the cluster subspace, and

(vi) analyzing data elements of the errors.

8. (Currently Amended) A method as claimed in claim 7, wherein step (e) (iii) comprises: comprising

~~_____ repeating the steps (v) to (vi) of deriving a subspace representing an error cluster and analyzing the resulting errors to produce a tree structure with a top node and further nodes corresponding to the error clusters in a hierarchical tree structure.~~

9. (Currently Amended) A method as claimed in claim 8 7, wherein step (e) (v) further comprises: comprising
_____ (vii) stopping the method if the step of analyzing determines that the data elements meet predetermined criteria deciding to stop the repeating step for a given cluster depending on the error values.

10. (Currently Amended) A method as claimed in claim 8, further comprising:
_____ extending the model using new data to add adding new nodes to the hierarchical tree structure by processing new input data.

11. (Previously Presented) A method of representing a data element derived from an object or image by processing signals corresponding to the object or image, the method comprising expressing the data element in terms of a representation derived according to claim 1.

12. (Original) A method in claim 11 comprising expressing the element in terms of a tree structure having nodes and determining coefficients of the element for nodes of the tree structure.

13. (Original) A method as claimed in claim 12 comprising using a membership value representing the degree to which the data element corresponds to a node.

14. (Currently Amended) A method as claimed in claim ~~12 or claim~~ 13 comprising quantizing the coefficients and/or the membership values.

15. (Previously Presented) A method as claimed in claim 1 involving data derived from an image or images in a sequence of images.

16. (Previously Presented) A method as claimed in claim 1 wherein the object or image corresponds to a person or a face.

17. (Currently Amended) A descriptor of a data element derived in accordance with a method according to any one of claims 11 to ~~14~~16, ~~or claim 15 or claim 16 dependent on claims 11 to 14.~~

18. (Original) A descriptor as claimed in claim 17 comprising partial descriptors corresponding to nodes in a tree structure, each partial descriptor comprising a node identifier, coefficients for a node and optionally a membership value.

19. (Previously Presented) A method of matching or classifying a query data element derived from an object or image by processing signals corresponding to the object or image, the method comprising comparing a descriptor of the query data element according to claim 17 with database descriptor elements according to claim 17 using a matching function.

20. (Previously Presented) Apparatus set up to execute a method according to claim 1.

21 (Original) Apparatus as claimed in claim 20 comprising a processor, memory and image or object input means.

22. (Currently Amended) Computer program embodied on a computer-readable medium for executing a method according to any one of claims 1 to 16 or 19.

23. (Original) Computer readable storage medium comprising a computer program as claimed in claim 21.

24. (New) A method claim for providing a representation of data distribution of data elements in an N multi-dimensional data space where N is greater than 2, and as claimed in claim 1.